Operations Manual

W-Gun™ Series MIG Guns

Issued Oct. 2014 • Index No. WCMAN-1.3

600 Amp W-Gun shown with one piece HD straight handle with rubber overmold.

600 Amp W-Gun shown with curved handle and hang up hook.

All Guns are Not Created Equal.

A MIG gun should be durable, easy to use and customized to your specific application. Our MIG guns put you in control: you choose the options you need and we'll build a gun to last. We even ship most of our guns within 24 hours.

Flexible cable assembly with reinforced synthetic rubber hoses prevents water leakage and provides increased water flow and reduced gas leakage.

Newly designed back end and water block with interchangeable direct plugs and trigger leads connect to wire feeders and machines from major manufacturers and allow for simple maintenance.

Multiple handle and trigger options to increase operator comfort.

Heavy duty water-cooled necks are offered in multiple length and bend configurations to allow for optimal weld accessibility and improved operator comfort.

Contact tip options include Centerfire™, Elliptical and Quik Tip™ and are available in wire sizes from .023" (0.6 mm) to 3/32" (2.4 mm).

See BernardWelds.com for detailed specs and replacement parts information.

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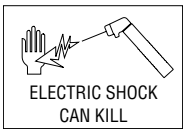
BERNARD™

BERNARD™ SAFETY PRECAUTIONS

WARNING

Some probability of death or serious injury



1. Arc welding equipment uses electric energy to create molten bonded metal. Protect yourself and others from possible electric shock/electrocution with proper training and review of safety manuals.
2. Equipment improperly used can cause fatalities.
   - 2.1 Turn off any electrically powered equipment and powered support equipment when not in use. Accidental grounding or activation of equipment can cause circuit completion, electric shock, arc flash, fires, and burns.
   - 2.2 Electrode, gun components, and work surfaces are electrical conductors. These surfaces are 'live' when system is in use.
     - 2.2.1 Typically 'stick' equipment is 'live' when equipment is on. Although modern MIG welding equipment disconnects power from the electrode when not in use, the potential for accidental triggering occurs. Treat all equipment with safety in mind.
   - 2.3 Check for proper termination.
     - 2.3.1 Check for proper grounding and attachments.
     - 2.3.2 Check for proper service termination of input to National Electrical Codes and local codes with trained and certified electricians.
     - 2.3.3 Keep welding ground as close to workpiece as possible.
     - 2.3.4 Inspect gun, holders, cords, clamps, terminators, and cables for frayed wires, defects, and abrasion leading to short circuit conditions or current capacity reductions.
     - 2.3.5 Use proper 'sized' guns, cables, and connections for current being carried. Use of equipment with duty cycle less than expected can lead to premature component degradation and short circuiting.
     - 2.3.6 Never touch two or more electrically 'live' parts together including guns and holders. This compounds open circuit voltage and provides feedback circuits with potential of electrical shock.
     - 2.3.7 Isolate components in automated equipment if possible. Place warning labels on electrically 'live' parts where isolation is not possible.
3. Wear proper safety equipment and clothing.
   - 3.1 Wear proper safety glasses or eye protection should arcing occur.
4. Disconnect power when making any service connections of equipment. 'Lock Out, Tag Out' all circuits and feeds.
5. Falls can be dangerous.
   - 5.1 Keep work area clear as not to trip or fall into open circuits, causing shock.
   - 5.2 When working at levels above ground, protect yourself from shock-causing falls.

WARNING

Some probability of death or serious injury

1. Never dip electrode in water for cooling.
2. Do not stand in water or on damp floors while welding, or do not weld in the rain. Avoid wearing wet or sweaty clothes as they provide an easier electric current path to you.
3. Always insulate yourself from the work and ground by wearing proper safety equipment and clothing.
   - 3.1 Isolate yourself from all moist conditions with dry hole-free clothing, gloves, and rubber-soled (nonconductive) shoes. Use a nonconductive platform to isolate yourself from conductors, water, and dampness.
   - 3.2 When welding in damp locations and in awkward positions, such as sitting or lying, make certain insulating material is large enough to cover your full area of physical contact with work and ground.
   - 3.3 Fix water leaks prior to welding, or immediately stop should they occur, and provide proper repair.
4. Keep everything dry including clothing, work area, cables, electrode holder, and power supply.
5. Never handle 'live' electrical or welding equipment with bare hands while standing in water or while hands and/or feet are wet. Dangerous electric shock can result.

WARNING

Some probability of death or serious injury

1. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations.
2. Always secure cylinders in an upright position to a fixed support so that they cannot be knocked over. Valve protection caps should always be in place except when cylinder is in use.
3. Locate cylinders clear of areas where they may be struck and safe distance from welding or any other source of heat, sparks, or flame.
4. Cylinders must be handled carefully to prevent damage to their walls, valves, or safety devices. Never lift cylinders by valves or caps.
5. Keep your head and face away from cylinder valve outlet regulator when opening cylinder valves.
6. All regulators, hoses, fittings, etc. should be properly maintained and in good condition as per the manufacturer's recommendations. Faulty equipment should be replaced immediately.
7. Never strike an arc on a cylinder or allow any other electrically 'live' parts to come in contact with a cylinder. This can cause a violent rupture or lead to a rupture during handling.

WARNING

Some probability of death or serious injury

1. The welding area.
   - 1.1 Remove all fire hazards from the weld area. If this is not possible, move work to a hazard-free area or cover all combustibles with a fire-resistant cover. Bear in mind that hot material and sparks from the welding process easily go through small cracks and openings into adjacent areas.
   - 1.2 Do not weld in areas which have a flammable atmosphere containing explosive gases or vapors. Avoid paint booths, solvent cleaning tanks, ventilators, and storage areas which contain grain or wood dust.
   - 1.3 After welding, turn off all equipment or place gun in a safe location in which no part of the electrode circuit is contacting the workpiece or ground. Accidental engagement could create a fire hazard.
   - 1.4 Keep all equipment clean, free of oil and grease.
   - 1.5 Keep the appropriate fire extinguishing equipment in weld area.
   - 1.6 A fire watcher must be present with the appropriate fire extinguishing equipment and until the area is deemed safe after welding if the following conditions exist:
     - 1.6.1 Combustibles are within the weld area.
     - 1.6.2 Combustibles which can be ignited by sparks are near the weld area.
     - 1.6.3 Openings in the floors, dividers, and walls may expose combustibles to weld sparks.
     - 1.6.4 Combustibles are adjacent to floors, dividers, or walls that could be ignited by radiant or conductive heat.
   - 1.7 After welding has been completed make sure the area is free of glowing embers, sparks, and any flames.
2. Equipment.
   - 2.1 See 'CYLINDERS MAY EXPLODE' section, #2 and #3.
   - 2.2 Periodically check all shielding gas line connections for leaks. Also check the condition of all hoses.
   - 2.3 Keep all protective clothing free of oil and grease.
   - 2.4 Flammable hair preparations should not be used.
   - 2.5 When working with gas-powered equipment, these precautions should be followed:
     - 2.5.1 Turn off engine and allow to cool before refueling.
     - 2.5.2 Carefully refuel equipment to prevent spillage. Wipe up all spilled fuel and do not restart engine until fumes have been eliminated.
     - 2.5.3 Never add fuel near an open flame, when engine is running, or while arc welding.
     - 2.5.4 Do not overfill fuel tank, heat may expand the fuel causing it to overflow and ignite.

WARNING

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1. Illness or death can result from breathing fumes, gases, or oxygen enrichment or depletion that welding may produce.
2. Provide proper ventilation to avoid breathing fumes and gases produced by welding. It may be necessary to supply fresh air to the welder with an air-supplied respirator or other means when working in a confined space.
3. The three major toxic gases associated with GMAW are ozone, nitrogen dioxide, and carbon monoxide.
4. Do not weld near degreasing or other cleaning operations involving chlorinated hydrocarbons. Heat and arc rays can react with solvent vapors and form phosgene, a highly toxic gas, along with other irritating products.
5. Shielding gases can displace air. Use special care to insure that breathing air is safe when welding in confined area. Upon entering a confined space, check the breathing air to make sure it is safe. Check gas connections for leaks after installation and regularly thereafter.
6. If welding causes dizziness, nausea, or respiratory irritation, ventilation is inadequate.
7. Operate engine-powered equipment in open, well-ventilated areas or exhaust the engine's fumes outdoors. Never ventilate with oxygen.
8. Read and understand the manufacturer's instructions for this equipment and other welding equipment. This includes the Material Safety Data Sheets (MSDS) and your employer's safety practices.

WARNING

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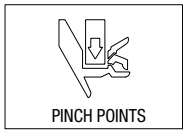
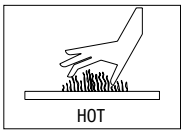


1. Keep clothing, tools, hands, fingers, or any other part of your body away from moving parts of the machine such as v-belts, gears, and fans.
2. Never operate any equipment without safety guards.

CAUTION

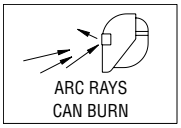
Minor personal injury
or damage to equipment



1. Hot metal such as electrode stubs and workpieces should never be handled.
   - 1.1 Serious burns and injury can occur from accidental contact with hot materials.
   - 1.2 Wear protective clothing to prevent burns to exposed skin.
     - 1.2.1 Wear insulated gloves.
     - 1.2.2 Wear clothing that resists heat penetration and ignition.
   - 1.3 Assume that all metal pieces in the weld area are hot.
2. If touching, always test any metal and discarded electrodes for heat. Do not assume any material in the welding area is cool to touch.
3. Mark welded work HOT or place small pieces in marked container.

CAUTION

Minor personal injury
or damage to equipment



1. The welding arc produces a bright light emitting concentrated volumes of ultraviolet and infrared rays. These rays are harmful to unprotected eyes or skin. Protection shall be taken to inhibit exposure.
2. Protect eyes from arc rays.
   - 2.1 Do not observe the arc or its reflection without eye protection including filtered lenses.
     - 2.1.1 Filters with cover plates shall be worn to reduce exposure to rays.
     - 2.1.2 Cracked or broken lenses should be replaced immediately, reducing risk of unfiltered light entry into eyes.
   - 2.2 Protect face area from arc rays by using proper hooding and shields.
     - 2.2.1 Hood shall be opaque.
     - 2.2.2 Hood shall be replaced immediately, reducing risk of unfiltered light entry, should cracks or holes occur.
3. Wear suitable clothing to reduce risk of burns to exposed skin.
   - 3.1 Wear durable, flame-resistant clothing with closed, opaque weaves. This reduces chance of 'sun' burn, contact burns, and accidental ignition of clothing that could occur.
     - 3.1.1 Do not wear wet or damp clothing.
   - 3.2 Wear appropriate gloves, shoes, and outer protection as described to prevent electrical shock.
4. Protect others from arc rays that can burn unintentionally.
   - 4.1 Provide suitable screening to reduce exposure of others to existing welding areas.
   - 4.2 Provide proper eye protection.
   - 4.3 Provide suitable clothing.

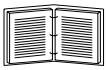
CAUTION

Minor personal injury
or damage to equipment

1. Improperly balanced equipment can result in personal injury and/or damage to equipment.
2. Check and maintain equipment daily for safe operation.
3. Read and understand the manufacturer's instructions for this equipment and other welding equipment. This includes your employer's safety practices.

NOTICE

For most
efficient operation



1. Material Safety Data Sheets are designed to help you understand how to safely work with chemicals and materials in your work area.
   - 1.1 Follow data sheet instructions for proper ventilation or respiration.
   - 1.2 Follow proper first aid treatment should accidents occur.
   - 1.3 Keep proper fire extinguishing equipment as denoted on data sheet.
   - 1.4 Do not exceed exposure limits.
   - 1.5 Dispose of material properly.
2. Read and understand data sheets regarding the hazards associated with the use of chemicals and materials.

SAFETY REFERENCES

AWS Z49.1	(ANSI) "Safety in Welding and Cutting"
AWS C5.6	"Recommended Safe Practices for Gas-Metal Arc Welding"
AWS F4.1	"Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping"
AWS C5.1	"Recommended Practices for Plasma Arc Welding"
AWS C5.3	"Recommended Practices for Air Carbon Arc Gouging and Cutting" *Available from the American Welding Society, P.O. Box 351040, Miami, Florida 33135*
ANSI Z41	"Standard for Personal Protection - Protective Footwear"
ANSI Z49.1	"Safety in Welding and Cutting"
ANSI Z87.1	"Practice for Occupational and Educational Eye and Face Protection"
ANSI Z88 .2	"Standard Practice for Respiratory Protection" *Available from the American National Standards Institute, 11 W. 42nd St., New York, NY 10036*
Code of Federal Regulations (OSHA) Section 29, Parts 1900-1910.999 and 1910.1000-	*Available from the U.S. Government Printing Office, Washington, DC 20402*
CSA W117.2	"Safety in Welding, Cutting, and Allied Processes" *Available from the Canadian Standards Association, 178 Rexdale Blvd., Rexdale, Ontario, Canada M9W 1R3*
CGA Pub. P-1	"Safe Handling of Compressed Gas in Containers" *Available from the Compressed Gas Association, 1725 Jefferson Davis Highway, Arlington. VA 22202-4100*
NFPA51B	"Fire Prevention in Cutting and Welding Processes"
NPFA70	"National Electrical Code" *Available from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269*

BERNARD SAFETY PRECAUTIONS CONTINUED…

EMF Information

Considerations About Welding And The Effects Of Low Frequency Electric And Magnetic Fields

Welding Current, as it flows through welding cables, will cause electronic magnetic fields. There has been and still is some concern about such fields. However, after examining more than 500 studies spanning 17 years of research, a special blue ribbon committee of the National Research Council concluded that: "The body of evidence, in the committee's judgment, has not demonstrated that exposure to power frequency electric and magnetic fields is a human-health hazard." However, studies are still going forth and evidence continues to be examined. Until the final conclusions of the research are reached, you may wish to minimize your exposure to electromagnetic fields when welding or cutting.

To reduce magnetic fields in the workplace, use the following procedures:

1. Keep cables close together by twisting or taping them.
2. Arrange cables to on side and away from the operator.
3. Do not coil or drape cables around your body.
4. Keep Welding power source and cables as far away from operator as practical.
5. Connect work clamp to workpiece as close to the weld as possible.

About Pacemakers:

Pacemaker wearers consult your doctor first. If cleared by your doctor, them following the above procedures is recommended.

California Proposition 65 Warning

This product contains chemicals, including lead, known to the state of California to cause cancer, and birth defects or other reproductive harm. *Wash hands after use.*

Introduction

Thank you for choosing Bernard. The product you have purchased has been carefully assembled and factory tested prior to shipment. Should you experience problems with installation or performance, please refer to the "Troubleshooting Guide" in this manual.

Before installing, compare the equipment received against the invoice to verify that the shipment is complete and undamaged. It is the responsibility of the purchaser to file all claims of damage or loss that may have occurred during transit with the carrier.

The manual contains general information on the operation of this Bernard product. Before installing or operating any equipment, read and understand the information and safety precautions presented in this manual. Also, note the various data plates, labels, and tags attached to the product.

While every precaution has been taken to assure the accuracy of this manual, Bernard assumes no responsibility for errors or omissions. Bernard assumes no liability for damages resulting from the use of the information contained herein. Bernard shall have no liability to the buyer for consequential damages or be liable to the in tort for any negligent manufacture of the goods or for the omissions of any warning therefrom.

Commercial Warranty

Product is warranted to be free from defects in material and workmanship for 180 days after the sale by an authorized Buyer.

Bernard reserves the right to repair, replace or refund the purchase price of non-conforming product. Product found not defective will be returned to the Buyer after notification by Customer Service.

Bernard makes no other warranty of any kind, expressed or implied, including, but not limited to the warranties of merchantability or fitness for any purpose. Bernard shall not be liable under any circumstances to Buyer, or to any person who shall purchase from Buyer, for damages of any kind. Including, but not limited to any, direct, indirect incidental or consequential damages or loss of production or loss of profits resulting from any cause whatsoever, including, but not limited to, any delay, act, error or omission of Bernard.

Genuine Bernard parts must be used for safety and performance reasons or the warranty becomes invalid. Warranty shall not apply if accident, abuse, or misuse damages a product, or if a product is modified in any way except by authorized Bernard personnel.

Operations Manual Index

Part I General Description
Part II Installation
Part III Helpful Operating Tips
Part IV Maintenance and Repair
Part V Troubleshooting

Part I General Description

The Bernard W-Gun is a water-cooled gun that is designed for processing mild steel electrode under GMAW (Gas Metal Arc Welding), MIG (Metal Inert Gas), MAG (Metal Active Gas), FCAW (Flux Cored Arc Welding), and MOG (Metal without Gas).

The Bernard W-Gun provides longer consumable life while reducing operator fatigue, which can increase overall welding effectiveness. Bernard W-Guns can reduce the downtime and expenses associated with changing consumables during the welding process. Lightweight and flexible design allows for easier movement during welding between standard horizontal welding, overhead, and hard-to-reach side angles. Bernard W-Guns can effectively reduce your operating cost and improve the productivity of your welding operation.

The Bernard W-Gun meets or exceeds NEMA (National Electrical Manufacturer's Association) EW3 and CE EN50078 requirements for guns used in a wide variety of applications including aluminum, silicone bronze, and hard facing alloys to name a few. With Bernard's flexibility, many applications can be accommodated with field installed options, increasing performance and maneuverability.

Part II Installation

1. Your gun has been shipped with a specific feeder connector and sized for electrode as per the part number indicated on its package. Please inspect the received gun against this part number for accuracy.
2. Turn off power prior to any installation.
3. Fully extend gun and cable. Press liner fully into power pin.
4. Safely expose approximately 2" (51 mm) of electrode beyond feeder or adaptor block.

5a. ***Bernard Quick Disconnect***
If you have purchased a Bernard Quick Disconnect gun, it is necessary to connect this unit to an adaptor kit providing the shielding gas, control circuit, and arc power. If this is a new installation, install the adaptor kit as per the kit instructions. With the Bernard adaptor installed, perform the following:

Orient power pin and gas pin with the adaptor receptacle. Slide the electrode into the liner and push the power pin into the socket. Rotate the locking sleeve until the locking pins of adaptor drop into the receiver of locking sleeve. Continue to engage power pin while twisting locking sleeve to make connection. Shielding gas, control circuit, and power are now engaged.

5b. ***Direct Plug***
Connect the power pin of the direct plug gun by sliding the electrode into the liner and the power fitting into the drive housing of the feeder. Fully seat the unit in position and tighten into place as designated in the manufacturer's instructions. On initial installations, a thin film of silicone lubricant will aid installation and prevent O-ring damage.

Attach control lead wires to the appropriate plug, terminals, or lead kit. Plug or wire into the control circuit of the feeder as designated in manufacturer's instructions.

If a gas hose is provided, connect to the feeder's solenoid circuit to deliver shielding gas to the arc. If no gas hose is provided, gas is delivered through the power pin. Refer to the manufacturer's instructions for proper gas connection at the feeder block or solenoid.

6. Connect water lines to a water coolant source. Each hose is identified for proper connection by a tethered drip cap (blue: water inlet, red: water outlet) and label. If a water hose hook-up kit is used, make all runs as short as possible. Always use hoses with at least a 3/16" inside diameter for extended runs. Reinforced hoses of high quality are recommended to prevent damage due to operating pressures, heat, and hose contamination. The coolant system must produce a minimum of 0.5 gpm at 60 psi. Run coolant through gun for approximately 2 minutes to purge system of entrapped air before applying power. Water must flow through the gun at all times while the power supply is on.
7. Remove nozzle from gas diffuser.

8a. Centerfire Tip – Remove tip holder by turning counterclockwise and then pull tip from gas diffuser. An unobstructed electrode path has now been established.

8b. Elliptical Tip – Remove tip with a 1/8-1/4 turn counterclockwise while pulling. An unobstructed electrode path has now been established.

8c. Quik Tip – Remove tip with a 1/4 turn counterclockwise. An unobstructed electrode path has now been established.

9. Safely feed electrode through the gun and approximately 1" (25 mm) beyond gas diffuser.

10a. Centerfire Tip – Reinstall the tip over the electrode and lock into position by reinstalling the tip holder. Reinstall nozzle.

10b. Elliptical and Quik Tip – Reinstall the tip over the electrode locking into position with a clockwise motion. Reinstall nozzle.

⚠ NOTICE ***Coolant must flow through the gun prior to and during welding. Welding current and duty cycle should not exceed published specification of this product. If such conditions exist, product life and performance will be reduced.***

Part III Helpful Operating Tips

Nozzles:

1. If anti-spatter is used, do not coat nozzle insulator as this may degrade insulating material.
2. Nozzle should be cleaned as often as possible. Spatter buildup can often lead to poor gas shielding or short circuiting between the contact tip and the nozzle.
3. Spatter should be removed with the proper tools designed for spatter removal.
4. In high temperature welding applications, heavy duty consumables are recommended.

Contact Tips, Gas Diffusers:

1. Centerfire and Elliptical contact tips may be removed and rotated in gas diffuser, providing additional wear surfaces and extending the service life of the product.
2. Electrical stickout of the elliptical contact tip can be altered by positioning the contact tip in the desired location of the gas diffuser and rotating clockwise locking in place.
3. Inspect nozzle for spatter adhesion, blocked gas ports, and carbonized contact surfaces. Clean as often as possible.
4. If anti-spatter is used, periodically check gas ports for blockage.
5. When using dual shield electrode, periodically check gas ports for clogging caused by flux from within the electrode.

Cable:

1. Periodically check torques of neck and end fittings. Loose fittings can cause overheating and premature failure of the gun.
2. Sharp bends and loops in the cable should be avoided. Often the best solution is to suspend the wire feeder from a boom or trolley, thus eliminating a large number of bends and keeping the cable clear of hot weldments.
3. Do not immerse liner into solvents for cleaning; the liner may be periodically blown out with compressed air.
4. Avoid rough surfaces and sharp edges that can cause tears and nicks in cable jacket which can cause premature failure.
5. Periodically check all cables and ground connections.
6. Use anti-seize on all threaded connections.

Feeder:

1. Check drive rolls for wear; be sure drive rolls and guide tubes are clean and free of debris. Do not overtighten drive rolls; set as per manufacturer's specifications.
2. Use clean, non-corroded electrode.
3. When installing or replacing electrode, you may: remove burrs from end of electrode, remove gas diffuser and tip, and/or straighten the first few inches of electrode.

End User Stocking Recommendations:

Nozzles..... 5 for every 1 gun in service

Tips..... 30 for every 1 gun in service

Gas Diffusers ..... 4 for every 1 gun in service

Triggers..... 1 for every 10 guns in service

Necks..... 1 for every 20 guns in service

Handle Kits..... 1 for every 20 guns in service

Replacement Cables..... 1 for every 20 guns in service

Strain Relief Kits ..... 1 for every 20 guns in service

Adaptor Kits ..... Order as Necessary

Direct Plug Kits ..... Order as Necessary

These stocking recommendations are only initial guidelines based on an 80 hour work period. You should work closely with your distributor to tailor a stocking program that suits your specific needs. Results will vary.

Part IV Maintenance and Repair

See Replacement Parts page of www.BernardWelds.com for complete parts lists and specs

⚠ CAUTION ***Disconnect gun from equipment, allow gun to cool, and remove electrode from liner before servicing.***

Section 1. General Inspection

1. Inspect gun periodically for worn or loose parts. Tighten, repair, or replace as necessary.
2. Periodically inspect outer cable cover for nicks or cuts that can cause short circuiting or allow the cable assembly's internal components to become exposed. Replace as necessary.
3. Inspect adapter and direct plug connection for wear that may cause overheating. Replace as necessary.
4. Change or rotate contact tip when arc tracking or arc instability is incurred. Please note; a tip may look worn but produce a stable arc with good results.
5. Clean the nozzle as often as possible to prevent spatter build-up. Excess spatter can lead to poor gas shielding or short circuiting. Replace the nozzle when worn.
6. Periodically check torques of all water connections to maintain cool and dry operation. Tighten as described in the following sections.
7. Replace liner system as electrode feeding becomes erratic.

Section 2. Nozzle

A. Removal

The nozzle is a friction fit which can be removed with a twisting and pulling motion.

B. Service

Inspect nozzle for cracks and degradation of insulation. Clean the nozzle as often as possible to prevent spatter build-up which can lead to poor gas shielding or short circuiting. Replace the nozzle when loose, worn, or producing erratic gas shielding.

C. Installation

Replace with a pushing and twisting motion.

Section 3. Contact Tip

Bernard has designed its contact tips to allow rapid installation and adjustment.

A. Removal

Cut electrode and remove all burrs before removing tip.

Centerfire Tip – Remove tip holder by turning counterclockwise and then pull tip from gas diffuser.

Elliptical Tip – Remove tip with 1/8-1/4 turn counterclockwise.

Quik Tip – Remove tip with a 1/4 turn counterclockwise.

B. Service

To extend contact tip life, reface front of tip and clean the bore. Centerfire and Elliptical tips may be rotated in gas diffuser socket providing additional wear surface and extending the service life of the product. Electrical stickout may be altered when using Elliptical tips by positioning the contact tip in the desired location of the gas diffuser before locking into place.

C. Installation

Centerfire Tip - Reinstall the tip over the electrode and lock into position by reinstalling the tip holder. Reinstall nozzle.

Elliptical and Quik Tip – Reinstall the tip over the electrode locking into position with a clockwise motion. Reinstall nozzle.

Section 4. Gas Diffuser

A. Removal

The gas diffuser may be removed with an appropriate wrench in a counterclockwise rotation.

B. Service

Inspect gas diffuser and Centerfire tip holder for spatter, blocked gas ports, and carburized surfaces. Clean as often as possible. Replace with new gas diffuser or Centerfire tip holder when wear prevents engagement of contact tip or nozzle.

C. Installation

Firmly secure gas diffuser with an appropriate wrench in a clockwise rotation. Always reinstall gas diffuser insulator to decrease the chances of short circuiting. Note that Centerfire gas diffuser does not require a gas diffuser insulator.

Section 5. Liner

A. Removal

Remove nozzle, contact tip, and gas diffuser. Lay cable straight. Grasp liner lock which protrudes from power pin (some direct plugs may require removal of additional components to access the liner lock) and remove from cable assembly by pulling.

B. Service

Inspect for excessive wear and debris on the inside diameter. Do not dip liner in solvents for cleaning. Liner may be periodically blown out with compressed air. Replace with new liner when excessive wear or debris produces poor electrode feed.

C. Installation

Insert liner into power pin with cable laying straight. Continue until liner lock is fully seated into power pin. A twisting motion may be necessary to seat o-ring (some direct plugs may require installation of additional components to secure liner). Trim and deburr the liner 3/8" (9.5 mm) past the nozzle end of the neck. Install gas diffuser and nozzle.

Section 6. Handle/Switch Assembly

I Curved Handle

A. Removal

Remove screws, post fasteners, and hang-up hook (See Figure 1). Separating handle halves will expose interior connections and trigger switch assembly. Slide switch assembly out of cavity and remove terminals from trigger.

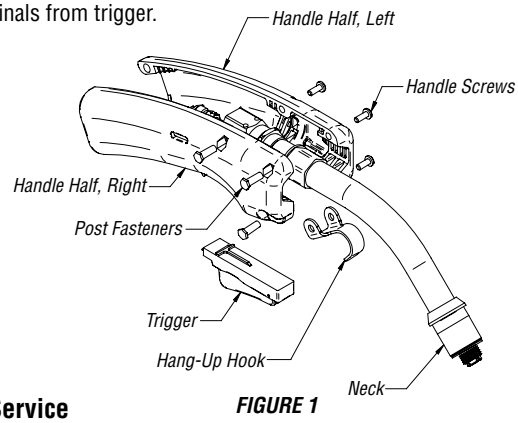


FIGURE 1

B. Service

Inspect for cracks, deformation of hex areas, debris, holes, loose or missing threaded inserts, excessive wear, exterior heat deformation, and warpage. If any of the above conditions exist, replace with new handle or clean all surfaces with mild detergent and reinstall. Test switch for continuity. Clean any debris from trigger, if necessary, replace with new trigger.

C. Installation

Begin assembly by placing the hexagon portion of the neck within the rear hexagon portion of the handle half. The hex bushing will be cradled within the forward hex locators. Install switch assembly by pressing control wire terminals fully onto terminals of switch assembly and slide assembly into switch cavity. Route hoses, cable, control wires, and switch as not to be pinched when reinstalling second handle half. Install hang-up hook, post fasteners, and handle screws. Tighten screws while being aware not to pinch cable jacket in joint between the handle halves.

II Legacy Straight Handle

A. Removal

Remove switch and screws from handle (See Figure 2). Remove

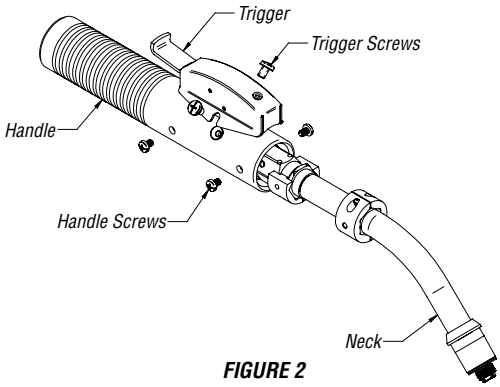


FIGURE 2

terminals from the switch assembly. Slide handle down the cable to gain access to neck connections. Neck must be removed to replace handle on all round handled guns except those with straight necks.

B. Service

Inspect for cracks, debris, holes, loose or missing threaded inserts, excessive wear, exterior heat deformation, and warpage. If any of the above conditions exist, replace with new handle or clean all surfaces with mild detergent and reinstall. Test switch for continuity. Clean any debris from trigger, if necessary, replace with new trigger.

C. Installation

Slide handle over power cable. Reinstall neck (See Figure 3). Place the hexagon bushing on the neck. Install aluminum spacers over the bushing and secure with screws. Install insulation spacers on hexagon water block and secure using pop rivet. Top mount switch assemblies require insulation spacers be mounted on the bottom of the hexagon water block. Bottom mount switch assemblies require insulation spacers be mounted on the top of the hexagon water block. Route control wires as not to be pinched when reinstalling handle. Align spacers and secure with screws. Install switch assembly into position by installing terminals onto the switch assembly and then secure with screws.

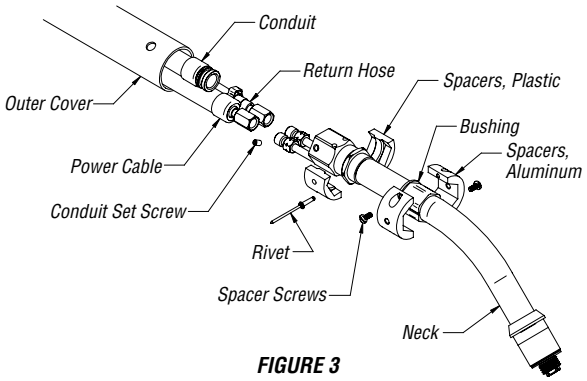


FIGURE 3

III HD Straight Handle

A. Removal

Remove switch and screws from handle (See Figure 4). Cut wires from the switch assembly to remove switch. Slide handle down the cable to gain access to neck connections. Neck must be removed to replace handle on all straight handled guns.

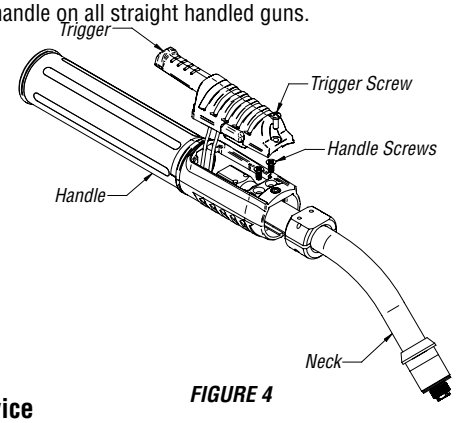


FIGURE 4

B. Service

Inspect for cracks, debris, holes, loose or missing threaded inserts, excessive wear, exterior heat deformation, and warpage. If any of the above conditions exist, replace with new handle or clean all surfaces with mild detergent and reinstall. Test switch for continuity. Clean any debris from trigger, if necessary, replace with new trigger.

C. Installation

Slide handle over power cable. Reinstall neck (See Figure 5). Locate aluminum spacer set as shown with machined flat facing switch assembly. Secure to neck with screws. Do not over tighten screws to prevent neck armor from being pierced. Route control wires as not to be pinched when reinstalling handle. Secure handle onto cable assembly using screws. Connect switch assembly by connecting control wires to switch with insulated butt connectors. Secure switch assembly to handle with screw.

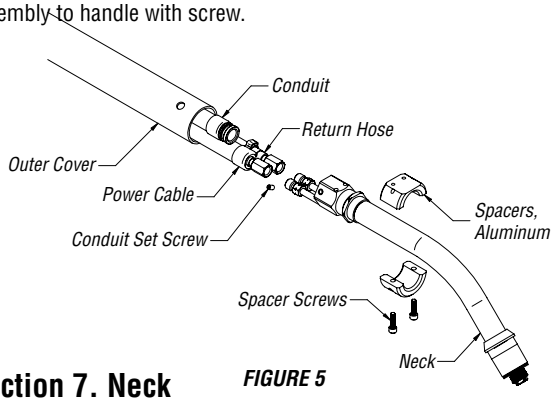


FIGURE 5

Section 7. Neck

A. Removal

Remove liner from cable assembly. The gas diffuser should remain installed to protect neck threads. Remove handle from gun assembly. Disconnect power cables and return hoses using a counterclockwise motion with one 5/16” and one 3/8” wrench. Do not allow the power cable and return hose fittings to twist. Using a 5/64” (2 mm) hex key, remove conduit set screw. Remove conduit from neck.

B. Service

Inspect neck for damaged threads, leaky water connections, excessive spatter build up on armor or armor that is damaged. If any of the above conditions exist, replace neck to ensure safe and reliable operation.

C. Installation

Install conduit into neck and secure with conduit set screw. See the next section for specific conduit installation instructions. Install and tighten power cable and return hose fittings to 35 in-lbs to prevent leakage. Avoid twisting power cable and return hose fittings during installation. Install handle and liner.

Section 8. Cable

I Power Cable/Return Hose

A. Removal

Remove handle, switch assembly, and open rear strain relief. Remove outer cover ties from both ends. Disconnect power cables and return hoses using a counterclockwise motion with one 5/16” and one 3/8” wrench. Do not allow the power cable, return hose, or rear water block fittings to twist which could result in breakage.

B. Service

Inspect power cable and return hose for leaks or hose material that has been damaged. If any of the above conditions exist, replace power cable or return hose to ensure safe and reliable operation.

C. Installation

While old cable is in place, fasten new cable to end of old cable using the cable tool that ships with replacement cables or tape. The old cable may now be used to pull the new through the outer cover. Install and tighten cable to 35 in-lbs using appropriate wrenches in a clockwise rotation to prevent leakage. Before installing handle or strain relief, circulate coolant through unit checking for leaks; reinstall outer cover ties on both ends and reassemble all remaining components.

II Conduit

A. Removal

Remove handle, switch assembly, liner, and open rear strain relief. Remove outer cover ties from both ends of outer cable covering. Use a 5/64” (2 mm) hex key to remove conduit set screws and release conduit connections (both ends).

B. Service

Inspect conduit assembly for cracks or gas leakage. If any of the above conditions exist, replace conduit assembly to ensure reliable operation.

C. Installation

While old conduit is in place, tape or splice new conduit to end of old conduit. The old conduit may now be used to pull the new through the outer cover. Moisten o-rings with water or soap. Do not use silicone or petroleum based lubricants. Slide conduit into socket on the end of the neck. Care must be taken not to nick or cut o-ring during installation. Look through the set screw hole to verify that the fitting has slid completely into the neck. Secure conduit with conduit set screw. Conduit attachment is similar at the direct plug end. Reinstall outer cover ties (both ends) and reassemble handle, strain relief, and liner.

III Control Leads

A. Removal

Remove handle, switch assembly, and open rear strain relief. Remove outer cover ties from both ends of outer cable covering. Be sure to cut leads at direct plug end as close to butt connector as possible to make certain there is enough wire to make the new connection.

B. Service

Inspect control leads for nicks, cuts, or shorts. If any of the above conditions exist, replace control leads to ensure safe and reliable operation.

C. Installation

While old control leads are in place, tape or splice new control leads to end of old control lead. The old control lead may now be used to

pull the new through the outer cover. Strip wires and crimp terminals as necessary to make proper connections. Leads should be looped at both ends to provide any extra length necessary for cable stretch and expansion. Reinstall outer cover ties (both ends) and reassemble handle, strain relief, and liner. Be careful not to pinch leads during assembly as this could cause a short circuit of the control system.

IV Outer Cable Cover

A. Removal

Removal of the outer cable cover requires the removal of either the neck or the direct plug, as well as the removal of the handle or strain relief on the opposite end. Remove ties holding outer cable cover to internal components. Anchor either hex of neck or rear water block lightly in a vise to retain internal cable components. Slowly slide outer cable covering off of the cable cluster approximately 6" at a time. Tape internal components every 6" to retain hose alignment for new installation. Remove from vise.

B. Service

Inspect outer cable cover for major nicks or cuts which expose inner cables. If any of the above conditions exist, replace outer cable cover to ensure safe and reliable operation.

C. Installation

With all cable internal components taped together, use welding electrode or wire as a lead. Whatever is used must be as long as or longer than the outer cable cover being applied. Slide wire through outer cable cover first, then anchor one end of the wire in a vise. Connect other end to cable cluster's disconnected end using tape. Slide outer cable cover over the cable cluster and into position (remove tape as outer cable cover is fitted over components). When the outer cable cover is completely installed, fasten the cover into position using cable ties. Install either the neck or the direct plug, whichever was removed.

Section 9. Rigid Strain Relief

A. Removal

Rotate the rear strain relief spring assembly in a counterclockwise rotation to remove from rigid strain relief. Slide the spring further onto the cable assembly and remove screw securing strain relief to adapter block.

B. Service

Inspect all components for cracks, debris, excessive wear, and breakage. Replace with new components if safety or performance of product is compromised.

C. Installation

Align flats in rigid strain relief with flats on adapter block. Slide strain relief onto adapter block and secure with screw. Using the arrows on the cap to align with mating grooves, slide the strain relief spring assembly toward the rigid strain relief until seated and turn in a clockwise rotation until engaging snap is felt.

Section 10. Direct Plug

I Bernard Quick Disconnect

A. Removal

Remove liner from gun assembly. Viewing quick disconnect from feeder end, align wave spring and snap ring with opening access slot (See Figure 6). Compress large snap ring with internal snap ring pliers and remove locking sleeve. Remove medium external snap ring from power pin using external snap ring pliers. Open rigid strain relief and remove wire assemblies from assembly by compressing the locking tabs on the contact pins with needle nose pliers and pulling the wire assemblies from the back. Unthread power pin from rear water block with appropriate wrenches in a counterclockwise rotation. Inlet and outlet hoses can be removed from rear water block by cutting Oetiker clamps with cutting pliers. The gas pin may be removed from the rigid strain relief by removing the small snap ring and pulling the pin from the rigid strain relief.

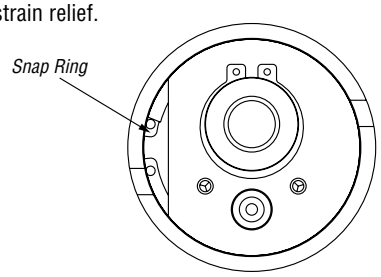


FIGURE 6

B. Service

Test contact pins for continuity when trigger is engaged. Lubricate o-rings with silicone lubricant. Inspect all components for cracks, debris, excessive wear, and breakage. Replace with new components if safety or performance of product is compromised.

C. Installation

Assemble gas pin into rigid strain relief and secure with small snap ring. Install inlet and outlet hoses by pushing hose onto barbed fitting on rear water block and secure with Oetiker clamp. Install power pin onto rear water block with appropriate wrenches in a clockwise rotation. Install wire assemblies into the two symmetrical holes on the back side of the rigid strain relief. Do not cross control wires from side to side. Make sure control pins are fully seated to ensure proper gun functionality. Slide the power pin back into the rigid strain relief. Rotate the power pin until the barbed fittings on rear water block are facing upward and away from the bottom of the rigid strain relief. (See Figure 7) Once the power pin is fully seated, secure it by installing the medium snap ring into the groove on the power pin. Close rigid strain relief and secure by installing the strain relief spring assembly. Position wave spring and large internal snap ring in opening access slot. With internal snap ring pliers inserted through locking sleeve, compress snap ring and slide sleeve into place. Snap ring must be fully seated in locking sleeve. Locking sleeve must be able to rotate freely around rigid strain relief. Install liner.

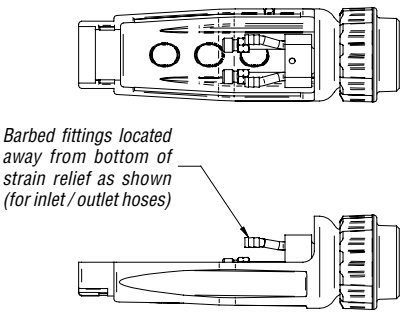


FIGURE 7

II Euro Direct Plug

A. Removal

Remove liner from gun assembly. Follow the steps required to remove the complete cable assembly from the rear water block. Inlet and outlet hoses can be removed from rear water block by cutting Oetiker clamps with cutting pliers. Disconnect the Euro block lead set from gun by cutting as close as possible on both sides of the butt connectors in order to preserve wire for later retermination. Remove screw that secures Euro block assembly to rigid strain relief. Slide adapter nut back in order to expose the machined flats on the Euro block assembly. Remove Euro block from rear water block and rigid strain relief by using the appropriate wrenches in a counterclockwise rotation.

B. Service

Test contact pins for continuity when trigger is engaged. Lubricate o-rings with silicone lubricant. Inspect all components for cracks, debris, excessive wear, and breakage. Replace with new components if safety or performance of product is compromised.

C. Installation

Place adapter nut onto rigid strain relief and secure by threading rear water block into Euro block assembly. Using the appropriate wrenches, tighten Euro block assembly onto the rear water block by rotating clockwise. Continue tightening connection until barbed fittings on rear water block are facing upward and away from the bottom of the rigid strain relief. (See Figure 7) Secure Euro block assembly to rigid strain relief using screw. Connect Euro block leads to control leads by connecting with insulated butt connectors. Install inlet and outlet hoses by pushing hose onto barbed fitting on rear water block and secure with Oetiker clamp. Follow the steps required to reassemble the complete cable assembly to the rear water block. Close rigid strain relief and secure by installing the strain relief spring assembly. Install liner.

III All Other Direct Plugs

A. Removal

Remove liner and rigid strain relief from gun assembly. Inlet and outlet hoses can be removed from rear water block by cutting Oetiker clamps with cutting pliers. Position control lead wires as necessary as not to damage them. Remove power pin from adapter block using appropriate wrenches in a counterclockwise rotation.

Note: For OXO direct plugs, rigid strain relief must be held gently in vise while using the appropriate wrench in a counterclockwise rotation to remove the power pin. Be careful not to crush or deform rigid strain relief while being held in vise.

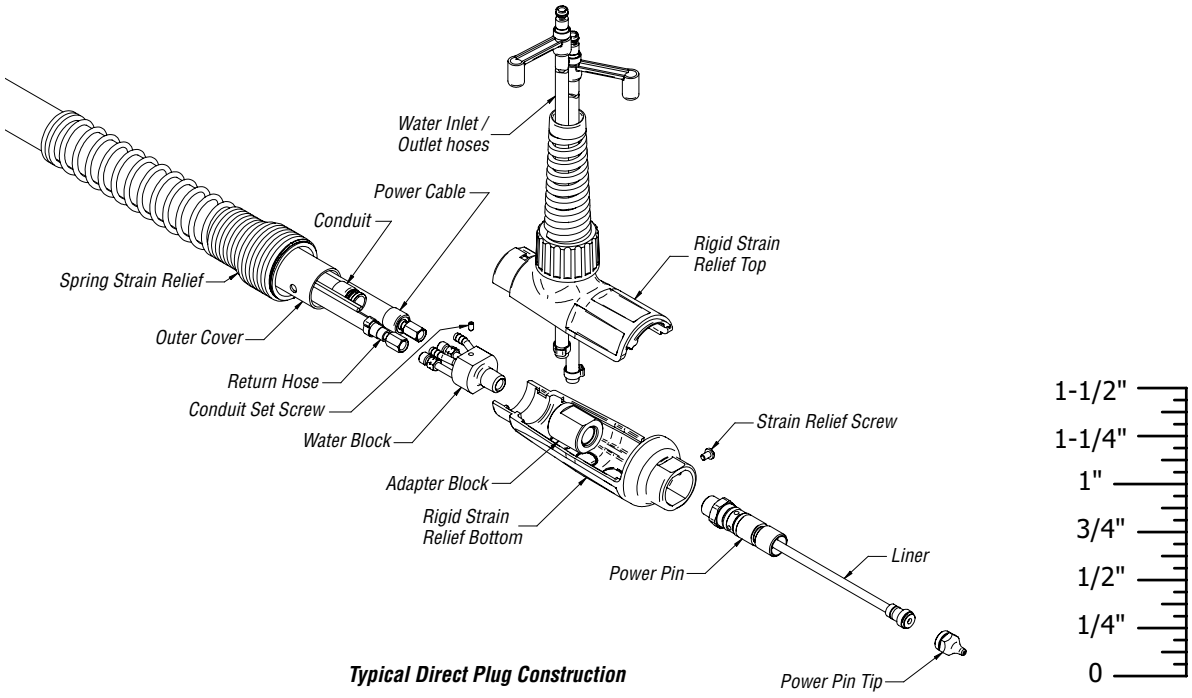
B. Service

Test contact pins for continuity when trigger is engaged. Lubricate o-rings with silicone lubricant. Inspect all components for cracks, debris, excessive wear, and breakage. Replace with new components if safety or performance of product is compromised.

C. Installation

Assemble power pin onto adapter block by using appropriate wrenches in a clockwise rotation. Make sure that the barbed fittings on rear water block are facing upward and away from the bottom of the rigid strain relief. (See Figure 7) Install inlet and outlet hoses by pushing hose onto barbed fitting on rear water block and secure with Oetiker clamp. Reinstall rigid strain relief and liner.

Note: For OXO direct plugs, rigid strain relief must be held gently in vise while using the appropriate wrench in a clockwise rotation to install the power pin. Be careful not to crush or deform rigid strain relief while being held in vise.



Typical Direct Plug Construction

Part V Troubleshooting Guide

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
1. Electrode does not feed	1. Feeder relay.	1. Consult feeder manufacturer.
	2. Broken control lead.	2 a. Test & connect spare control lead. b. Install new cable.
	3. Poor adaptor connection.	3. Test & replace leads and/or contact pins.
	4. Worn or broken switch.	4. Replace.
	5. Improper drive roll size.	5. Replace with proper size.
	6. Drive roll tension misadjusted.	6. Adjust tension at feeder.
	7. Burn back to contact tip.	7. See 'Contact Tip Burn Back'.
	8. Wrong size liner.	8. Replace with correct size.
	9. Buildup inside of liner.	9. Replace liner, check condition of electrode.
2. Contact tip burn back	1. Improper voltage and/or wire feed speed.	1. Set parameters.
	2. Erratic wire feeding.	2. See 'Erratic Wire Feeding'.
	3. Improper tip stickout.	3. Adjust nozzle/tip relationship.
	4. Improper electrode stickout.	4. Adjust gun to base metal relationship.
	5. Faulty ground.	5. Repair all cables & connections.
3. Tip disengages from gas diffuser	1. Worn gas diffuser.	1. Replace tip and/or gas diffuser.
	2. Improper tip installation.	2. Install as per 'Maintenance & Repair' (Section 3).
	3. Extreme heat or duty cycle.	3. Replace with heavy duty consumables. See appropriate spec sheet for details.
4. Short contact tip life	1. Contact tip size.	1. Replace with proper size.
	2. Electrode eroding contact tip.	2. Inspect and/or change drive rolls.
	3. Exceeding duty cycle.	3. Replace with properly rated Bernard gun.
5. Erratic arc	1. Worn contact tip.	1. Replace.
	2. Buildup inside of liner.	2. Replace liner, check condition of electrode.
	3. Wrong tip size.	3. Replace with correct size tip.
	4. Not enough bend in neck.	4. Replace with 45° or 60° neck.
6. Erratic wire feeding	1. Buildup inside of liner.	1. Replace liner, check condition of electrode.
	2. Wrong size liner.	2. Replace with new liner of proper size.
	3. Improper drive roll size.	3. Replace with proper size drive roll.
	4. Worn drive roll.	4 a. Replace with new drive roll. b. Stone edge of groove on drive roll.
	5. Improper guide tube relationship.	5 a. Adjust/replace guide as close to drive rolls as possible. b. Eliminate all gaps in electrode path.
	6. Improper wire guide diameter.	6. Replace with proper guide diameter.
	7. Gaps at liner junctions.	7 a. Replace with new liner trimming as per 'Maintenance & Repair' (Section 5). b. Replace guide tube/liner, trim as close to mating component as possible.
	8. Feeder malfunction.	8. Consult feeder manufacturer.
	9. Contact tip.	9. Inspect and replace.*

Part V Troubleshooting Guide (cont.)

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
7. Extreme spatter	1. Improper machine parameters.	1. Adjust parameters.
	2. Improper tip installation.	2. Adjust nozzle/tip relationship.
	3. Improper shielding.	3 a. Verify shielding gas coverage.
		b. Verify gas mixture.
	4. Contaminated wire or work piece.	4. Clean wire and work piece.
8. Porosity in weld	1. Insulator worn.	1. Replace nozzle/insulator.
	2. Gas diffuser damaged.	2. Replace gas diffuser.
	3. Extreme heat or duty cycle.	3. Replace with heavy duty consumables.
	4. Solenoid faulty.	4. Replace solenoid.
	5. No gas.	5 a. Install full tanks.
		b. Check supply.
		c. Hose leaks.
	6. Flow improperly set.	6. Adjust.
	7. Gas ports plugged.	7 a. Clean or replace gas diffuser.
		b. Clean nozzle.
	8. Ruptured gas hose.	8. Repair or replace cable or line.
	9. Control circuit loss.	9. See 'Electrode Does Not Feed'.
	10. Worn, cut or missing O-rings.	10. Replace O-rings
	11. Loose fittings.	11. Tighten gun & cable connections to specified torque. See 'Maintenance & Repair' (Section 8).
9. Gun running hot	1. Exceeding duty cycle.	1. a. Replace with properly rated Bernard gun.
		b. Decrease parameters to within gun rating.
	2. Loose or poor power connection.	2. a. Clean, tighten or replace cable grounding connection.
		b. Tighten gun & cable connections to specified torque. See 'Maintenance & Repair' (Section 8).
	3. Improper water flow	3. Verify proper water flow
	4. Exceeds water cooler capacity	4. Replace with properly rated water cooler
10. Liner is discolored full length	1. Short circuit to electrode.	1. Isolate electrode reel from feeder and drive block. Consult feeder manufacturers manual.
	2. Broken copper stranding in power cable.	2. Replace power cable assembly as per 'Maintenance & Repair' (Section 8).
11. Sporadic feeding of aluminum electrode	1. Tip galling.	1. *Inspect & replace.
	2. Synthetic liner melting.	2. a. Replace liner.
		b. Replace with composite liner.
	3. Wire deformed by feed rolls.	3. Adjust drive rolls as per feeder manufacturer's manual.

*In some cases with aluminum and mild steels, it may be necessary to use a contact tip with either a larger or smaller bore size.

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